



Serial No. 09/544,822

IN THE CLAIMS:

Claim 64 has been amended herein. All of the pending claims 1 through 5, 7 through 32 and 58 through 64 are presented below. This listing of claims will replace all prior versions and listings of claims in the application. Please enter these claims as amended.

Listing of Claims:

1. (Previously Presented) A method for applying a material between a semiconductor device having a surface and a substrate having a surface, said method comprising: applying a liquid wetting agent layer to one of said surface of said semiconductor device and said surface of said substrate; and applying a flowable underfill material between the substrate and the semiconductor device, such that said flowable material contacts said liquid wetting agent layer.
2. (Previously Presented) The method according to claim 1, wherein said semiconductor device is attached to said substrate.
3. (Previously Presented) The method of claim 1, wherein said liquid wetting agent layer includes a layer of silane-based material.
4. (Previously Presented) The method according to claim 1, wherein said applying said liquid wetting agent layer comprises any one of a dispensing method, a brushing method, and a spraying method.
5. (Previously Presented) The method according to claim 1, wherein said liquid wetting agent layer comprises at least one layer.
6. (Canceled)

7. (Previously Presented) The method according to claim 1, wherein said liquid wetting agent layer comprises a plurality of layers.
8. (Previously Presented) The method according to claim 1, wherein said liquid wetting agent layer comprises one of glycidoxypyltrimethoxysilane and ethyltrimethoxysilane.
9. (Previously Presented) The method according to claim 1, wherein said applying a liquid wetting agent layer comprises providing a material that to the surface of one of said surface of said semiconductor device and said surface of said substrate for the application of an underfill material.
10. (Previously Presented) A method for applying a material between a semiconductor device and a substrate, said method comprising:
providing a semiconductor device having an active surface, another surface, a first end, a second end, a first lateral side, and a second lateral side, said first end, said second end, said first lateral side, and said second lateral side forming at least a portion of a periphery of said semiconductor device;
providing a substrate having an upper surface, a first side wall, a second side wall, a first lateral side wall and a second lateral side wall;
applying a liquid wetting agent layer to one of said active surface of said semiconductor device and said upper surface of said substrate; and
applying a flowable underfill material between said semiconductor device and said substrate, such that said flowable material contacts said applied liquid wetting agent layer.
11. (Previously Presented) The method according to claim 10, wherein said flowable material is applied substantially adjacent to at least one end of said semiconductor device.
12. (Previously Presented) The method according to claim 10, wherein said flowable material substantially fills a gap between said semiconductor device and said substrate.

13. (Original) The method according to claim 10, wherein said substrate includes an aperture extending through said substrate.

14. (Previously Presented) The method according to claim 13, wherein said aperture is located adjacent to said another surface of said semiconductor device.

15. (Previously Presented) The method according to claim 10, wherein said flowable material is provided substantially adjacent to said at least a portion of the periphery of said semiconductor device to fill a gap between said substrate and said semiconductor device.

16. (Original) The method according to claim 10, further comprising:
elevating at least said first side wall of said substrate and said first end of said semiconductor device.

17. (Previously Presented) The method according to claim 16, wherein said elevating said first side wall of said substrate comprises placing said substrate on a support structure and elevating at least one portion of said support structure.

18. (Original) The method according to claim 16, further comprising:
providing a dam on the substrate adjacent to at least one of said first end, said second end, said first lateral side and said second lateral side of said semiconductor device.

19. (Original) The method according to claim 18, wherein said dam extends to substantially between said semiconductor device and said substrate.

20. (Original) The method of claim 10, further comprising:
vibrating one of said semiconductor device and said substrate.

21. (Original) The method according to claim 20, wherein said vibrating one of said semiconductor device and said substrate comprises placing said substrate on a support structure and vibrating said support structure.

22. (Previously Presented) The method according to claim 10, wherein said applying said flowable material comprises:
providing said flowable material substantially adjacent said first end of said semiconductor device for filling between said substrate and said semiconductor device by one or more forces acting upon said flowable material.

23. (Previously Presented) The method according to claim 10, wherein said substrate includes at least one aperture extending through said substrate and substantially located adjacent to said another surface of said semiconductor device.

24. (Previously Presented) The method according to claim 23, wherein said flowable material is provided through said at least one aperture of said substrate substantially filling a gap between said substrate and said semiconductor device.

25. (Previously Presented) The method according to claim 18, wherein said applying said flowable material comprises:
providing said flowable material substantially adjacent to said first end of said semiconductor device for filling a gap between said substrate and said semiconductor device.

26. (Previously Presented) The method according to claim 18, wherein said applying said flowable material comprises:
providing said flowable material substantially adjacent to said first end and one of said first lateral side and said second lateral side of said semiconductor device for filling a gap between said substrate and said semiconductor device.

27. (Previously Presented) The method according to claim 18, wherein said substrate includes at least one aperture extending therethrough and substantially located adjacent to said another surface of said semiconductor device.

28. (Original) The method according to claim 27, wherein said flowable material is provided through said at least one aperture.

29. (Original) The method according to claim 28, wherein said flowable material is provided from below said substrate.

30. (Previously Presented) The method according to claim 28, wherein said flowable material is provided through said at least one aperture contacting at least a portion of said another surface of said semiconductor device.

31. (Previously Presented) The method according to claim 10, wherein said applying said flowable material between said semiconductor device and said substrate further comprises placing said semiconductor device and said substrate in a chamber, said chamber having an atmosphere therein having a variable pressure.

32. (Previously Presented) The method according to claim 31, further comprising: varying the pressure of said atmosphere in said chamber for said flowable material substantially filling a gap between said semiconductor device and said substrate.

33. (Withdrawn) A semiconductor device comprising:
the semiconductor device having an active surface, at least a portion of said active surface having
a wetting agent layer thereon.

34. (Withdrawn) The semiconductor device according to claim 33, wherein said wetting agent layer includes silane.

35. (Withdrawn) The semiconductor device according to claim 33, wherein said wetting agent layer includes at least one layer.
36. (Withdrawn) The semiconductor device according to claim 33, wherein said wetting agent layer comprises one of glycidoxypopyltinethoxysilane and ethyltrimethoxysilane.
37. (Withdrawn) The semiconductor device according to claim 33, wherein said wetting agent layer reduces surface tension of said active surface.
38. (Withdrawn) A semiconductor assembly comprising:
a semiconductor device having an active surface;
a substrate having an upper surface; and
a wetting agent layer provided on one of said active surface of said semiconductor device and said upper surface of said substrate.
39. (Withdrawn) The semiconductor assembly according to claim 38, wherein said wetting agent layer includes silane.
40. (Withdrawn) The semiconductor assembly according to claim 38, wherein said wetting agent layer includes at least one layer.
41. (Withdrawn) The semiconductor assembly according to claim 38, wherein said wetting agent layer comprises one of glycidoxypopyltinethoxysilane and ethyltrimethoxysilane.
42. (Withdrawn) A semiconductor assembly comprising:
a semiconductor device having an active surface;
a substrate having an upper surface;
a wetting agent located on a portion of one of said active surface of said semiconductor die and said upper surface of said substrate; and
an underfill material located between said substrate and said semiconductor device.

43. (Withdrawn) The semiconductor assembly according to claim 42, wherein said wetting agent comprises silane.

44. (Withdrawn) The semiconductor assembly of claim 42, wherein said wetting agent comprises at least one layer.

45. (Withdrawn) The semiconductor assembly according to claim 43, wherein said silane comprises any one of glycidoxypopyltinethoxysilane and ethyltrimethoxysilane.

46. (Withdrawn) A semiconductor assembly comprising:
semiconductor device having an active surface having at least one bond pad thereon, another surface, a first end, a second end, a first lateral side and a second lateral side;
a substrate having an upper surface having at least one circuit thereon, a first side wall, a second side wall, a first lateral side wall and a second lateral side wall;
at least one bump connecting said at least one bond pad on said active surface of said semiconductor device to said at least one circuit on said upper surface of said substrate, said at least one bump forming a gap between said semiconductor device and said substrate;
an underfill material provided between said substrate and said semiconductor device; and
a wetting agent layer provided on at least a portion of one of said active surface of said semiconductor device and said upper surface of said substrate.

47. (Withdrawn) The semiconductor assembly according to claim 46, wherein said wetting agent layer comprises silane.

48. (Withdrawn) The semiconductor assembly according to claim 46, wherein said underfill material substantially fills said gap between said semiconductor device and said substrate.

49. (Withdrawn) The semiconductor assembly according to claim 46, said substrate further including an aperture extending therethrough.

50. (Withdrawn) The semiconductor assembly according to claim 49, wherein said aperture is located adjacent said another surface of said semiconductor device.

51. (Withdrawn) The semiconductor assembly according to claim 46, wherein said wetting agent layer comprises one of glycidoxypopyltinethoxysilane and ethyltrimethoxysilane.

52. (Withdrawn) A semiconductor assembly comprising:
a semiconductor device having an active surface;
a substrate having an upper surface;
an underfill material provided between said substrate and said semiconductor device; and
a wetting agent layer provided on a portion of said active surface of said semiconductor device
and a portion of said upper surface of said substrate.

53. (Withdrawn) The semiconductor assembly according to claim 52, wherein said wetting agent layer comprises at least one layer.

54. (Withdrawn) The semiconductor assembly according to claim 52, wherein said wetting agent layer comprises one of silane, glycidoxypopyltinethoxysilane and ethyltrimethoxysilane.

55. (Withdrawn) A semiconductor assembly comprising:
a semiconductor device having an active surface having a plurality of bond pads thereon;
a substrate having an upper surface having a plurality of circuits thereon;
a plurality of bumps connecting said plurality of bond pads on said active surface of said semiconductor device to said plurality of circuits on said upper surface of said substrate, said plurality of bumps forming a gap between said semiconductor device and said substrate;

an underfill material provided between said substrate and said semiconductor device; and
a wetting agent layer provided on said active surface of said semiconductor device and on said upper surface of said substrate.

56. (Withdrawn) The semiconductor assembly according to claim 55, wherein said underfill material substantially fills said gap between said semiconductor device and said substrate.

57. (Withdrawn) The semiconductor assembly according to claim 55, further comprising an aperture extending through said substrate.

58. (Previously Presented) A method for attaching a semiconductor assembly, said method comprising:
providing a semiconductor device having an active surface;
providing a substrate having an upper surface;
applying a liquid wetting agent layer to one of said active surface of said semiconductor device and said upper surface of said substrate;
connecting said semiconductor device to said substrate so that said active surface of said semiconductor device faces said upper surface of said substrate; and
applying a flowable underfill material between the substrate and the semiconductor device, such that said flowable underfill material contacts said applied wetting agent layer.

59. (Previously Presented) The method according to claim 58, wherein applying said wetting agent layer comprises any one of a dispensing method, a brushing method, and a spraying method.

60. (Previously Presented) The method according to claim 58, wherein said wetting agent layer comprises at least one layer.

61. (Previously Presented) The method according to claim 58, wherein said wetting agent layer comprises a silane-based material.

62. (Previously Presented) A method for attaching a semiconductor assembly, said method comprising:

providing a semiconductor device having an active surface, a first end, a second end, a first lateral side end and a second lateral side end;
providing a substrate having an upper surface, a first side wall, a second side wall, a first lateral side wall and a second lateral side wall;
applying a silane-based material layer to one of a portion of said active surface of said semiconductor device and a portion of said upper surface of said substrate;
connecting said semiconductor device to said substrate so that said active surface of said semiconductor device faces said upper surface of said substrate; and
applying a flowable underfill material between said semiconductor device and said substrate, such that said flowable underfill material contacts said applied silane-based material layer.

63. (Previously Presented) The method according to claim 61, wherein said wetting agent layer comprises one of glycidoxypyrpyltrimethoxysilane and ethyltrimethoxysilane.

64. (Currently Amended) A method for applying a material between a semiconductor device having a surface and a substrate having a surface, said semiconductor device mounted on said substrate, said method comprising:

applying a essentially uniform liquid silane-based wetting agent layer having a total thickness of about a monolayer to at least one of said surface of said semiconductor device and said surface of said substrate; and
applying a flowable underfill material between the substrate and the semiconductor device separately from said liquid silane-based wetting agent layer, such that said flowable material contacts said wetting agent layer.